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AUTHOR Hobbs, Dave; Armstrong, James
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ABSTRACT

The last few years have seen a growth in interest in the concept of distance-learning in the field of education and in the use of teleworking to provide a way of conducting work from home. Current predictions suggest that these could become very significant ways of learning and working in the future. The contention of this paper is that distance learning will continue its early adoption of many of the existing techniques and technologies used for teleworking. It therefore starts by describing an investigation into the working environment of teleworking, examining the currently debated issues associated with it, and laying out the potential advantages and drawbacks. Views solicited from workers currently operating within a teleworking regime in a large United Kingdom organization are presented. A small-scale experimental study of the psychological and sociological effects associated with teleworking is then described, and the results discussed. Finally, the implications for tele-education are considered. (Author)

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An Experimental Study of Social and Psychological Aspects of Teleworking: The Implications for Tele-Education

Dr Dave Hobbs, James Armstrong

School of Computing, Leeds Metropolitan University, UK; email: d.hobbs@lmu.ac.uk

Abstract: The last few years have seen a growth in interest in the concept of distance-learning in the field of education and in the use of teleworking to provide a way of conducting work from home. Current predictions suggest that these could become very significant ways of learning and working in future.

The contention of this paper is that distance learning will continue its early adoption of many of the existing techniques and technologies used for teleworking. It therefore starts by describing an investigation into the working environment of teleworking, examining the currently debated issues associated with it, and laying out the potential advantages and drawbacks.

Views solicited from workers currently operating within a teleworking regime in a large UK organisation are presented. A small-scale experimental study of the psychological and sociological effects associated with teleworking is then described, and the results discussed. Finally, the implications for tele-education are considered.

1. Teleworking

The term teleworking is not one that is clearly defined, and it is often used to encompass a number of different styles of work. For example, it includes people working *at home* (such as programmers), people working *from home* (such as salespeople), and people working *at workcenters* (such as telecottages and satellite offices).

[Gray et al 1995] defines teleworking as 'a flexible way of working which covers a wide range of work activities, all of which entail working remotely from an employer, or from a traditional place of work, for a significant proportion of work time.' He goes on to point out that teleworking may be on either a full-time or a part-time basis, and that the work often involves electronic processing of information, and always involves using telecommunications to keep the remote employer and employee in contact with each other. Whilst this is a useful working definition, it should be noted that it excludes traditional 'outworkers' as well as those who work at home only occasionally. Other terms commonly used in place of teleworking are telecommuting, networking, remote working, flexible working, and homeworking.

Gray (op cit) classifies as *full-time* homeworkers those who work at home for most of the working day, visiting an office occasionally for meetings or to pick up material. Computer programmers, systems analysts, catalogue-shopping telephone order agents, and data entry clerks fit into this category. *Part-time* homeworkers he defines as those based in an office but spending two or three days a week working at home. At present these tend to be managers and professionals who can justify the additional expenditure on information technology equipment at home and work, but as hardware prices continue to fall dramatically it will increasingly become an option for a wider range of workers.

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Mobile or location-independent teleworkers are those who spend most of their time out of the office or home, either 'on the road' or in customers' premises. Salespeople, service engineers and consultants are typical of this grouping. Throughout the world, location-independent teleworkers represent one of the most populous and well-established groups of teleworking.

Another identifiable group of teleworkers is those who work at a work center. These can vary from a rural telecenter or telecottage to a company satellite office - a small office remote from the company head office that is not self-sufficient but relies on communications with the head office. Retaining some of the ethos and work patterns of the conventional central office working, the work center may be more attractive to workers who may find it hard to adapt to full homeworking and to managers who might find difficulty with managing a set of geographically dispersed individuals. At the same time, telecenter working offers some of the benefits of homeworking.

2. Claimed Advantages and Disadvantages of Teleworking

Teleworking can bring advantages for the employer, the employee and the environment. It may also provide new job opportunities for the disabled, alleviating some of the effects of immobility.

[Reid 1993] suggests that cost savings can be achieved through teleworking by reducing the need for centrally maintained offices in expensive locations. Further, [Gray et al 1995] and [Heap 1995] find teleworkers to be more productive than office bound staff who have to travel to work and tend to suffer a higher level of stress. Teleworking is generally regarded as a 'green' activity, primarily because of the reduction in travel, the consequent fuel savings and lessening of pressure on congested city centers and overstretched public transport.

Against this, Reid (op cit) cites loss of status and professional isolation as potential dangers for workers moving into teleworking. There will need to be considerable change in management attitudes in many organizations and contractual arrangements for teleworkers will have to strike a careful balance which allows them to feel an integrated and valued member of the workforce as opposed to an inferior and exploited individual.

Worse, teleworking could be seen as a halfway house to redundancy. For many workers, the social interaction of the work place is all-important, and were the isolation of teleworking to be enforced on these workers, they could find the job no longer worthwhile.

3. Psychological Aspects Associated with Social Isolation

For the individual, the disadvantages of becoming a teleworker are predominately psychological. In some teleworking scenarios individuals may be totally isolated from interaction with society. This may be either through their own choice as in the case of a writer or musician retreating alone to the mountains to compose, or else through necessity such as a research scientist who is required to take seismic readings for an oil company in a desolate environment such as Antarctica. In the latter case the only contact with others may be through infrequent e-mail messages detailing instructions, and it is in such situations that the effects of social isolation on the individual are likely to be at their most severe.

[Myers 1996] draws a distinction between loneliness and aloneness, pointing out that an individual can feel lonely in the middle of a crowded party, and yet not feel lonely when working alone in an office on an absorbing piece of work. It would seem vitally important for a socially isolated teleworker that they should be in regular contact with others on a social level and not just through their working environment if they are to stay mentally healthy and continue to perform their work duties efficiently. This social contact could be achieved through using modern technology such as video-conferencing, cellular telephones, fax and electronic mail, all of which should help to lessen the individual's feeling of loneliness.

Perceived loss of status can be another major problem for some individuals both inside and outside the workplace. [Messe, Kerr and Sattler 1992] note that in many everyday and laboratory situations, people assigned a superior status come to see themselves as meriting favorable treatment or as capable of superior performance. [Humphrey 1985] showed this effect in a simulated business office in which subjects were arbitrarily assigned as 'managers' or 'clerks'. After the role-play exercise, 'managers' and 'clerks' alike judged the randomly created 'managers' to be more intelligent, assertive and displaying leadership qualities. Similar effects of assigned status on performance have been found in experiments with elementary school children [Jemmott and Gonzalez, 1989] and [Musser and Graziano 1991], and demeaning roles were found to undermine self-ability by [Myers 1996].

It would seem vitally important, therefore, that if an employer were to decide to deploy some of their employees in a teleworking environment they should ensure that they help them overcome these dangers and make a smooth transition into the teleworking environment. For example, prestigious sounding teleworker job titles could be created, and teleworking employees could receive special mentions in company bulletins or newsletters.

4. Teleworkers' Views

In order to ascertain views of teleworkers themselves, a questionnaire was devised and sent to teleworkers working for a UK telecommunications company. The workers held a variety of job titles such as teleworking systems engineer, technical advisor, technical officer, development engineer, and teleworking technician.

Length of teleworking service was found to vary from two to eight years with an average of four years, and the number of days spent away from the office/workplace environment ranged from three to five days per week with an average of four days per week. The teleworkers themselves commented favorably on the flexibility which their style of working allowed, particularly in terms of travel between work locations, but also in terms of scheduling the work. There was relatively little response when asked to list disadvantages, and was confined to the loss of the social banter of the traditional office. The general feeling was that it could be extremely difficult to return to the more rigid traditional workplace after having experienced teleworking.

5. Teleworking Experiments

One of the major debates revolving around teleworking in the present day working climate is whether the quality of work using modern teleworking methods such as electronic mail is to the same standard as that produced using more traditional working practices [Gray et al 1995] and [Reid 1993].

To investigate this controversial issue further, two experiments were devised to allow the observation of a team of three subjects while they worked together in trying to solve a problem. For comparison, they were firstly observed working in a traditional working environment around a table, and then working in isolation from each other using only electronic mail for communication as in a typical teleworking environment.

Both experiments had a set time limit to generate a realistic level of stress as might be found in this situation in the real world. As a measure of the stress levels experienced by the subjects under the two working environments, their pulse rates were taken before and after completion of the tasks in both experiments.

In the first experiment, the three subjects were isolated in a room together with a standard survival-type problem-solving exercise – the establishing of importance ratings to fifteen items to a space crew stranded on the moon. The aim was to observe how quickly and successfully the team worked their way towards NASA's recommended solution.

Initially, after having read the problem description, a balanced discussion involving all three participants took place. However, after six minutes of the allotted twenty had passed and the first five most important items had been identified, the discussion changed dramatically. The team began to have difficulty in deciding how the remaining items on the list were to be rated, and by the ten-minute mark, one subject had taken the role of a leader whereas another had withdrawn from the discussion.

With five minutes left, the silent member began to contribute again and a more balanced discussion ensued, with voting where necessary, through to completion of the task with thirty seconds to spare.

Although the team's solution was not identical to NASA's, it was very close and acceptable. Pulse rates were found to have increased by eight beats per minute for the two most active subjects, a sizeable increase, probably a reflection of the degree of heated discussion they undertook, and by four beats per minute for the less active one.

All three subjects indicated they enjoyed the task and the environment of close proximity working. The less active subject claimed he had felt overpowered by the personalities of the other two when the discussions ran into disagreement declaring '... they seemed oblivious to my suggestions so I decided to take a back seat role and leave them to argue it out'.

The second experiment was based around a desert survival exercise which again required identification of important items for a team stranded, this time, in the desert. It was devised to ascertain how the three subjects could work together while being isolated from each other and using only electronic mail for communication as in a typical teleworking environment. Subjects worked at networked PCs, each in a separate room so that no visual or verbal communication was possible. A slightly extended time limit of twenty-five minutes was set to allow for the poor performance of the computer network being used.

After reading the problem definition, the subjects started to exchange their initial thoughts via the email system. They soon established the key features of the problem and offered each other suggestions for the items that should rank high in the importance rating. Within eleven minutes they had correctly identified the five most important items. They then moved onto items lower down the list at which point it soon became apparent that they had strongly differing views and some considerable time (eight minutes) was spent with each justifying his own judgement. Eventually one member drew attention to the limited time left, and within the remaining six minutes agreement was finally reached on each item's degree of importance. Apparently this process was aided by the extensive reasoning which had already taken place earlier.

Again, the team was found to have developed a good solution when compared to that of the 'expert'. This time, pulse rates were found to have risen by only two beats per minute for two subjects and by three for the third, a result that suggests the teleworking environment was less stressful, perhaps by being less confrontational. Indeed, no leader emerged throughout this problem solving exercise, and there was generally equal participation. Indeed, the previously less active subject commented that he felt he had had a better opportunity to express his opinions using e-mail.

All three subjects again enjoyed working on the task, but two reported that after the novelty value had worn off they did not like this working environment, one of them stating that he did not like the feeling of being isolated and by himself. The third did not mind the environment but nevertheless did not feel he would wish to work for long periods of time under those conditions.

6. Analysis of Experimental Findings

As far as completing the tasks was concerned, both environments proved to be highly successful in achieving the solving of the problems. The second experiment showed that the teleworking environment facilitated an even distribution of ideas and contributions from all three subjects. Whereas in the round table working a leader

had emerged to dominate the discussion, and one member had become overwhelmed by the force of debate, in the teleworking environment the quieter subject was able to contribute on a more equal basis. This might suggest that the teleworking environment encourages broader, more democratic discussion.

The face-to-face working environment of the first experiment appeared to be more stressful for the participants, although on balance, this was the style of working that the subjects finally felt they marginally preferred.

7. Implications for Tele-Education

The educational systems across the globe are coming under increasing pressure to become more efficient and more flexible to the needs of the learners. In particular, people are increasingly requiring and seeking education or retraining beyond the traditionally assigned ages. Distance education is seen as a possible solution for many of these in that workers can receive in-time training without having to leave work to travel to an educational institution, and foreign students may study in another country without the expense of having to leave their own.

This study coupled with the experimental work suggests that certain guidelines could be proposed in order to increase the success of a transition towards a tele-education environment for students and trainees. For example, the success of an educational homeworking arrangement is largely dependent on the course tutor and the homeworker, and it is therefore important that both are enthusiastic about teleworking, aware of potential benefits and disadvantages, and clear about how the arrangement will operate.

If a tele-education arrangement is to be a success it is important that the potential student has appropriate personal qualities that allow them to work unsupervised or be supervised remotely. These include self-motivation, self-discipline, commitment to learning, adaptability, self-organization, and ability to work with little social contact.

More generally, working, reporting and communication arrangements between the student, tutors and other students will need to be established, as well as any attendance requirements on the part of the student. Ensuring that the student does not become isolated from the educational institution and other students will probably be a priority. The experimental evidence described above provides some anecdotal evidence that collaborative problem-solving, such as often found in group assignment work, can take place adequately or even more effectively using a distance technology such as email. However, occasional attendance at class meetings will go some way towards preventing isolation if this is feasible.

8. Conclusions

The driving forces that have motivated teleworking are unlikely now to be halted. Likewise the pressures on education worldwide are also unlikely to abate in the near future. Against this, the costs of telecommunications are falling, as is the cost of bandwidth hungry technologies such as video-conferencing. These factors are likely to hasten an evolutionary change in working and learning practices as a long-term consequence of the information technology revolution.

However, in both cases, rather than a sudden change, it is more likely that there will be a gradual, evolutionary change in working and learning practices as a long-term consequence of the information technology revolution. In all probability, teleworking will increasingly be absorbed into the mainstream of normal working practice and tele-education gradually phased in for appropriate groups of students. More flexible, location-independent working and study practices will emerge. It will become accepted practice for workers to spend part of their time working outside the traditional office or studying within it.

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